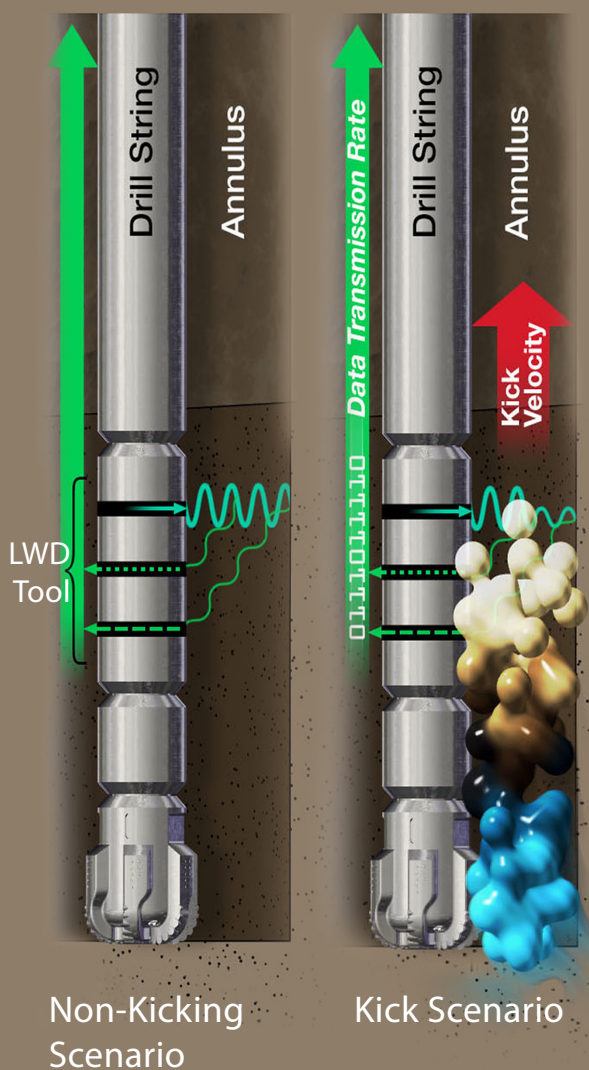


Available for Licensing



Kick Detection at the Bit: Low-cost Monitoring and Early Detection

Conceptual Model-Sensing Kick Conditions



Qualitative difference in annular interference

NOT TO SCALE

Opportunity:

Researchers at the U.S. Department of Energy's National Energy Technology Laboratory (NETL) have developed a cost-effective and near real-time early kick detection system which will provide drillers and drilling operations with an early warning before the kick ascends to the rig floor. This system leverages data obtained from logging while drilling (LWD), measurement while drilling (MWD), or seismic while drilling (SWD) signals to detect kicks near the drill bit. The advantage of this approach is that it utilizes technology and data streams already acquired in most drilling operations, thus minimizing additional costs while providing downhole kick monitoring. The technology is available for licensing and/or further collaborative research.

Overview:

Shutdown costs, time, personnel safety, and ecosystem damage associated with well bore loss of control events are a large concern of the drilling industry. Kicks are indicative of a loss of wellbore stability and/or anomalous geopressure in the wellbore environment and are a persistent risk for operators during the drilling process. Current kick detection techniques rely on return of fluids/gases to the wellhead and/or rig floor 1000's of feet above the drill bit and are often risky and expensive. Many systems have a time delay for the mud pit gains to return to the surface and the need for costly, specialized equipment. Moreover, many existing kick detection technologies have a high rate of false alarms. Therefore, a reliable but low-cost early warning detection technique is needed. Many exploratory and exploitation wells drilled for subsurface hydrocarbons utilize "while-drilling" tools (logging-while-drilling [LWD], measurement-while-drilling [MWD], or seismic while drilling [SWD]) to guide the drilling operation. These tools and signals can also be used to collect data about conditions inside the wellbore to

(continued)



Principal Investigator:
Kelly Rose

identify kicks, including information on kick composition and potentially volume. The NETL approach takes these intra-wellbore data signals and uses a suite of filters and algorithms to monitor, in real-time, wellbore conditions near the bit. If a kick happens, the data changes and before the physical kick material makes its way to the surface, information can be provided to the driller minutes to hours earlier than conventional methods.

Significance:

NETL's Kick Detection Technology provides:

- Real-time detection of changes within the wellbore
- Reduction of risk and potential human and environmental impacts associated with loss of control events
- Incurrence of no or minimal additional operational expenses
- Significant cost savings due to less drilling downtime

Applications:

Onshore and offshore subsurface drilling operations.



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Related Patents and Patent Applications:

- U.S. Non-provisional Patent Application No. **14/852,845** filed September 14, 2015, titled "Kick Detection at the Bit Using Wellbore Geophysics." Inventors: Kelly K. Rose, Brian Tost, and Fred Aminzadeh